

Applicants: Robert J. Krupa; Peter G. Lorenz; and Thomas V. Root  
For: Compact, High-Efficiency, High-Power Solid State Light Source  
Using A Single Solid State Light-Emitting Device

- 1 1. A compact, high-efficiency, high-power, solid state light source, comprising:  
2 a high-power solid state light-emitting device; and  
3 a light guide having a proximal light-receiving end held proximate the light-emitting  
4 device, and a distal light-transmitting end spaced farther from the light-emitting device.
- 1 2. The light source of claim 1, wherein the light-emitting device comprises a light-emitting  
2 diode (LED).
- 1 3. The light source of claim 2, wherein the LED emits white light.
- 1 4. The light source of claim 3, wherein the LED emits a broadband visible light including at  
2 least the 470-700nm wavelength band.
- 1 5. The light source of claim 2, wherein the LED has a light emitting area that is about 1mm  
2 square.
- 1 6. The light source of claim 2, wherein the LED comprises a white light emitting substance  
2 that emits when excited by the diode.
- 1 7. The light source of claim 2, wherein the LED draws up to 5W of power.
- 1 8. The light source of claim 1, wherein the light guide comprises a bundle of a large number  
2 of small diameter individual fibers.
- 1 9. The light source of claim 8, wherein the fibers have diameters of about 30-50  
2 micrometers.
- 1 10. The light source of claim 8, wherein the fibers are made of glass or plastic.
- 1 11. The light source of claim 8, further comprising a ferrule that surrounds the fiber bundle.
- 1 12. The light source of claim 11, wherein the ferrule is located close to but not at the  
2 proximal end of the fiber bundle.

- 1 13. The light source of claim 1, wherein the light-emitting device defines a substantially flat  
2 light-emitting surface.
- 1 14. The light source of claim 13, wherein the proximal end of the light guide is essentially  
2 flat and is located directly on the light-emitting surface of the light-emitting device.
- 1 15. The light source of claim 2, further comprising a light-conducting material between the  
2 light-emitting device and the proximal end of the light guide, the material having a refractive  
3 index between that of the light-emitting surface and that of the light guide.
- 1 16. The light source of claim 15, wherein the light-conducting material comprises a silicone-  
2 based device encapsulant material.
- 1 17. The light source of claim 15, wherein the light-conducting material comprises an index-  
2 matching gel.
- 1 18. The light source of claim 15, further comprising a structure that at least partially contains  
2 the material.
- 1 19. The light source of claim 18, wherein the structure comprises at least part of the dome  
2 lens that surrounds the material.
- 1 20. The light source of claim 19, wherein the dome lens is configured to have an essentially  
2 flat surface against which the proximal end of the light guide is held.
- 1 21. The light source of claim 1, wherein the light guide comprises a single glass or plastic  
2 fiber.
- 1 22. The light source of claim 1, wherein the light guide comprises a fiber optic or solid taper  
2 coupled to a large number of small diameter light guide fibers.
- 1 23. The light source of claim 1 located within an endoscope.

1 24. The light source of claim 1 configured as a self-contained source of illumination further  
2 comprising a battery power source.

1 25. A compact, high-efficiency, high-power, solid state light source, comprising:

2 a high-power solid state white light-emitting diode (LED);

3 a light guide comprising a bundle of a large number of small diameter fibers, the bundle  
4 having an essentially flat proximal light-receiving end proximate the light-emitting device, and a  
5 distal light-transmitting end spaced farther from the light-emitting device; and

6 a mechanical light guide fixing device coupled to the light guide near its proximal end, to  
7 hold the proximal end of the light guide in position directly against the light-emitting surface of  
8 the LED.